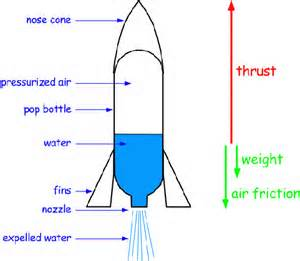
**Water Bottle Rockets And So Much More: Connecting It All!**

**Tennessee Science Teachers Association Conference**

Pre-Conference Workshop - November 6, 2014



**Presenters**

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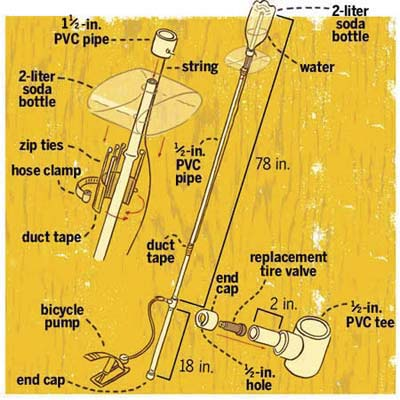
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**Presentation Wiki:**

<http://closereadingandtechnicalwritingitq.wikispaces.com/Day+2>

*Recommended Resource:* ***NASA* - All About Water Rockets**  
[http://exploration.grc.nasa.gov/education/rocket/BottleRocket/about.htm](http://exploration.grc.nasa.gov/education/rocket/BottleRocket/about.htm" \t "_blank)

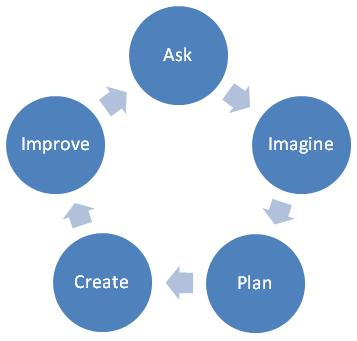


Bottle Rocket Launcher Design

This Old House

(*instructions included on wiki*)

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**Engineering Design Process**

**Water Bottle Rockets Activity**

1. Ask *Or* Identify the Problem

You are a member of a team working for NASA that has been challenged to build a toy rocket that works off air pressure and water. This toy will be sold in NASA gift shops and in museum gift shops across the country. NASA has provided you with a launcher. Your challenge is to determine the best design for your rocket to allow it reach enough altitude to sustain flight for as long as possible. You also need to determine the optimum amount of air pressure (psi) and volume of water to add for your rocket.

1. Imagine – Brainstorm Ideas and analyze the options

Review the factors that contribute to the motion of a water bottle rocket found at NASA’s “All About Water Rockets” website.

<http://exploration.grc.nasa.gov/education/rocket/BottleRocket/about.htm>

Select “Start your Journey”. Complete Rocket Research 101 to learn more about thrust and acceleration, Rocket Research 102 to learn more about rocket stability, and Rocket Research 103 to learn about drag. Take notes & make sketches about the main ideas in your Interactive Notebook. Determine what attributes you will emphasize in your rocket and use annotated drawings to document your ideas. Analyze the pros and cons to different factors that contribute to the motion of the rocket.

1. Plan – Draw a diagram & gather needed materials

Before you construct, sketch an annotated diagram of your group’s proposed rocket. List the materials that you will need. Select one of the research problems on the “Hypothesis Worksheet” and write a hypothesis in the form of “If…then…because…” If your group can think of another research problem that they would like to explore, write an additional hypothesis. Label your independent and dependent variables. Determine what data you will need to collect in order to test your hypothesis (amount of water, amount of pressure, altitude, flight time of rocket,…)

1. Create – Follow the Plan. Test it Out!

Construct your team’s bottle rocket and collect data based upon your group’s research questions.

1. Improve – Discuss what you can do to make your work better. Repeat steps 1-5 to make changes as time permits.

*Present your Prototype and Data Results to the group.*

Each group will enter data into a Google Spreadsheet – located at the Teacher Station. This will allow everyone to sort and make comparisons of data.

**Concluding Writing Activity**

Based upon data your group collected as well as the data collected by every group, compare and contrast the factors that impact the motion of the rocket. Focus on one or more of these questions as time permits.

1. Do I have to use water? Why can't I just use pressurized air?
2. Is more water better?
3. How can I modify the design of the rocket to increase the duration of the flight?
4. What effect will the wind have on the way I launch the rocket?
5. How will the wind affect the rocket after it is launched?
6. How can I modify the design of the rocket to increase its chances of making a field goal or reaching a goal?

**Plan** – Draw a diagram & gather needed materials

* sketch an annotated diagram of your group’s proposed rocket (*Use the four-question strategy sheet on following page as needed*)
* select one of the research problems on the “Hypothesis Worksheet” and write a hypothesis in the form of “If…then…because…” If your group has an alternate research problem that they would like to explore, write a different hypothesis.
* Determine what data you will need to collect in order to test your hypothesis (amount of water, amount of pressure, flight time of rocket,…)

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**Create** – Follow the Plan. Test it Out!

* Construct your team’s bottle rocket and collect data based upon your group’s research questions.

**Improve** – Discuss what you can do to make your work better. Repeat steps 1-5 to make changes as time permits.

**Concluding Writing Activity**

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**Helpful iPad Apps**

|  |  |
| --- | --- |
| **Vernier Video Physics**  **TTU-LSuters:Users:lsuters:Desktop:Screen Shot 2014-11-05 at 7.23.03 AM.png**  **$4.99** | Video Physics brings automated object tracking and video analysis to iPhone, iPod touch, and iPad. Capture video of an object in motion, then tap to track the object automatically. Video Physics instantly creates trajectory, position, and velocity graphs for the object. Video Physics is perfect for science students and instructors. Perform on-the-go analysis of interesting motion. Measure the velocity of a child’s swing, a roller-coaster, or a car. Or, take a video of a basketball free throw shot. Video Physics will display the path of the ball and provide graphs of y vs. x as well as the x and y position and velocity as a function of time. |
| Rocket Lander G-8: Beyond the Moons of Saturn TTU-LSuters:Users:lsuters:Desktop:Screen Shot 2014-11-05 at 7.30.53 AM.png  **Free** | Pilot a rocket down to the surface in this game challenging game of skill. By simply controlling the left, right and main engines of a lunar lander, you must safely touch down on a landing pad before you run out of fuel.  There are 25 levels in the standard game. You can also play a set of 10 randomly-generated levels. Plus there are two special challenge levels. You can play the main levels in sequence and go for a high score, or practice each level individually. |
| **Autodesk Digital STEAM Applied Mechanics**  **TTU-LSuters:Users:lsuters:Desktop:Screen Shot 2014-11-05 at 7.33.41 AM.png**  **Free** | Teaches the principles of applied mechanics by exploring five interrelated topics: Energy & Work, Force, Power, Loading, and Mechanisms. These concepts are essential in the development of innovative products and product systems and learning about how things work. |
| **SimpleRockets**  **TTU-LSuters:Users:lsuters:Desktop:Screen Shot 2014-11-05 at 7.34.44 AM.png**  **$1.99** | Design your own rocket ships. Blast off into space. Explore the solar system. See if you have what it takes to be a rocket scientist. |
| **Rocket Science 101**  **TTU-LSuters:Users:lsuters:Desktop:Screen Shot 2014-11-05 at 7.36.35 AM.png**  **Free** | You don't have to be a rocket scientist to launch a NASA spacecraft with NASA's Rocket Science 101 (RS101)! Select your favorite NASA mission and build a rocket to send the spacecraft into orbit. As you take the RS101 challenge, you can learn more about thrilling missions and the various components of the launch vehicles, how they are configured and how they work together to successfully launch a NASA spacecraft. NASA's Launch Services Program (LSP) does the same things for real rockets and exciting spacecraft missions every day - now it's your turn! |
| **NASA Visualization Explorer**  **TTU-LSuters:Users:lsuters:Desktop:Screen Shot 2014-11-05 at 7.40.28 AM.png**  **Free** | NASA SCIENCE: REVEALED! This is the NASA Visualization Explorer, the coolest way to get stories about advanced space-based research delivered right to your iOS device. A direct connection to NASA’s extraordinary fleet of research spacecraft, this app presents cutting edge research stories in an engaging and exciting format. See the Earth as you’ve never seen it before; travel to places otherwise unavailable to even the most intrepid explorers! |

**Source:** [**http://www.speedofcreativity.org/2014/05/05/ipad-apps-about-rockets-spacecraft-design-and-astronomical-engineering/**](http://www.speedofcreativity.org/2014/05/05/ipad-apps-about-rockets-spacecraft-design-and-astronomical-engineering/)

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